VIA FACSIMILE 1-703-872-9306

15-CT-5419
PATENT

**Remarks**

The Office Action mailed March 19, 2004 has been carefully reviewed and the following remarks are made in consequence thereof.

Claims 1-20 are pending. Claims 1 and 16 are amended. No new matter has been added. Claims 1-20 are rejected.

The objection to Claims 1 and 16 is respectfully traversed. Claims 1 and 16 have been amended as suggested in the March 19, 2004 Office Action. Applicant respectfully requests the objection be withdrawn.

The rejection of Claims 1, 3-6, 9, and 11 under 35 U.S.C. § 103 as being unpatentable over Toth et al. (U.S. Patent 5,982,846) in view of Oomori et al. (Japanese patent application number JP 03259569A) and Fujise (U.S. Patent 4,641,328) is respectfully traversed.

Toth et al. describe a detector array that includes a plurality of detector modules (20) (column 3, lines 61-62). The detector includes a plurality of modules and each module includes a plurality of detector cells (column 2, lines 58-60). A detector which has non-segmented cells along the z-axis, and/or a detector which has multiple modules with multiple elements along the x-axis and/or z-axis joined together in either direction to acquire multislice scan data simultaneously, can be utilized (column 2, lines 60-65). The detector module includes a switch apparatus (66) electrically coupled to a decoder (68) (column 4, lines 8-9). The switch apparatus is a multidimensional semiconductor switch array of similar size as the photodiode array (column 4, lines 9-11). In one embodiment, the switch apparatus includes an array of field effect transistors with each field effect transistor (FET) having an input, an output, and a control line (column 4, lines 11-14). Particularly, each switch apparatus FET input is electrically connected

to a photodiode array output and each switch apparatus FET output is electrically connected to DAS, for example, using flexible electrical cable (70) (column 4, lines 16-19). Notably Toft et al. are silent with respect to any staggered half detector segments that are separated by a gap therebetween, and any staggered half detector segments are abutted in regions about a centerline extending in the z-direction. Applicant respectfully traverses the assertion that "Toth et al. discloses...a plurality of staggered half detector segments abutted in regions about a center line (Fig. 4, #20)" on page 3, lines 1 to 7 of the Office Action dated March 19, 2004. Rather, Toth et al. discloses a known detector array including a plurality of full sized module detector sections 20.

Oomori et al. describe a method in which an electrode is provided on a periphery of split electrodes for forming a unit detecting element in a unit (Purpose). The method enhances concentration resolution of a radiation image-receiving device (Purpose). When the units are arranged for constituting an array, all the split electrodes are arranged in a zigzag form in such a way that they are positioned at equal intervals in a longitudinal direction of the array (Purpose, Figure 4). Notably Oomori et al. are silent with respect to any staggered half detector segments that are separated by a gap therebetween, and any staggered half detector segments are abutted in regions about a centerline extending in the z-direction. Applicant respectfully traverses the assertion that "Oomori et al. teaches...a plurality of staggered half-detector segments abutted in regions about a center line extending in a z-direction (Fig. 4, #5)" on page 3, lines 13 to 15 of the Office Action dated March 19, 2004. Rather Oomori appears to illustrate units in a zigzag form that overlap in a direction traverse to the z direction (i.e., patient axis) and are not abutted in regions about a center line.

Fujise describes a computed tomography apparatus in which data is acquired during one or more full rotational cycles and suitably stored by scanning a beating heart or similar objects and in which a complete image corresponding to a cross section of the beating heart is produced on a CRT screen and is correlated with a specific portion of the heart cycle reconstructed from

the limited data taken during a time interval which is a small fraction of the duration of the heart cycle (Abstract).

Claim 1 recites a method for imaging an organ of a patient including the steps of "scanning a volume of a patient's body including an organ of the patient with a computed tomographic (CT) imaging system having a radiation source and a detector array coupled to a rotating gantry, the detector array having a z-direction parallel to an axis of rotation of the gantry and an x-direction transverse to the z-direction; acquiring attenuation data from a plurality of staggered half detector segments of the detector array, wherein said staggered half detector segments are separated by a gap therebetween, said staggered half detector segments are abutted in regions about a centerline extending in the z-direction, and said staggered half detector segments include at least a first type of detector module having a cable extending into the gap; and-reconstructing an image including the patient's organ using the acquired attenuation data."

None of Toth et al., Oomori et al., and Fujise, considered alone or in combination, describe or suggest a method for imaging an organ of a patient including the steps of scanning a volume of a patient's body including an organ of the patient with a computed tomographic (CT) imaging system having a radiation source and a detector array coupled to a rotating gantry, the detector array having a z-direction parallel to an axis of rotation of the gantry and an x-direction transverse to the z-direction, acquiring attenuation data from a plurality of staggered half detector segments of the detector array, where the staggered half detector segments are separated by a gap therebetween, the staggered half detector segments are abutted in regions about a centerline extending in the z-direction, and the staggered half detector segments include at least a first type of detector module having a cable extending into the gap, and-reconstructing an image including the patient's organ using the acquired attenuation data.

Moreover, none of Toth et al., Oomori et al., and Fujise, considered alone or in combination, describe or suggest acquiring attenuation data from a plurality of staggered half

detector segments of the detector array, where the staggered half detector segments are abutted in regions about a centerline extending in the z-direction. Rather, Toth et al. describe that each switch apparatus included within the detector module has an FET output that is electrically connected to the DAS using a flexible electrical cable, Oomori et al. describe split electrodes that are arranged in a zigzag form in such a way that they are positioned at equal intervals in a longitudinal direction of the array, and Fujise describes a computed tomography apparatus in which data is acquired during one or more full rotational cycles and suitably stored by scanning a beating heart or similar objects. For at least the reasons stated above, Claim 1 is submitted to be patentable over Toth et al. in view of Oomori et al., and further in view of Fujise.

Claim 3 recites a radiation detector for an imaging system, the radiation detector having "a centerline extending in a z-direction and including a plurality of staggered half detector segments abutted in regions about said centerline and separated from one another by a gap, said staggered half detector segments each comprising a plurality of detector modules, and said plurality of detector modules include at least a first type of detector module having a cable extending into the gap."

None of Toth et al., Oomori et al., and Fujise, considered alone or in combination, describe or suggest a radiation detector for an imaging system, the radiation detector having a centerline extending in a z-direction and including a plurality of staggered half detector segments abutted in regions about the centerline and separated from one another by a gap, the staggered half detector segments each including a plurality of detector modules, and the plurality of detector modules include at least a first type of detector module having a cable extending into the gap.

Moreover, none of Toth et al., Oomori et al., and Fujise, considered alone or in combination, describe or suggest the plurality of detector modules that include at least a first type of detector module having a cable extending into the gap. Rather, Toth et al. describe that each

VIA FACSIMILE 1-703-872-9306

15-CT-5419
PATENT

switch apparatus included within the detector module has an FET output that is electrically connected to the DAS using a flexible electrical cable, Oomori et al. describe split electrodes that are arranged in a zigzag form in such a way that they are positioned at equal intervals in a longitudinal direction of the array that overlap in longitudinal direction which is traverse to the z direction and are not abutted in regions about any center line, and Fujise describes a computed tomography apparatus in which data is acquired during one or more full rotational cycles and suitably stored by scanning a beating heart or similar objects. For the reasons set forth above, Claim 3 is submitted to be patentable over Toth et al. in view of Oomori et al. and further in view of Fujise.

Claims 4-6, 9, and 11 depend from independent Claim 3. When the recitations of Claims 4-6, 9, and 11 are considered in combination with the recitations of Claim 3, Applicant submits that dependent Claims 4-6, 9, and 11 likewise are patentable over Toth et al. in view of Oomori et al., and further in view of Fujise.

For the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claims 1, 3-6, 9, and 11 be withdrawn.

The rejection of Claims 2 and 7 under 35 U.S.C. § 103 as being unpatentable over Toth et al. in view of Oomori et al. and Fujise, and further in view of Cuppen (U.S. Patent 6,259,766) is respectfully traversed.

Toth et al., Oomori et al., and Fujise are described above. Cuppen describes a detector system, looking in a direction from an X-ray source, of a computer tomography device while using a first adjustment of an X-ray collimator (column 5, lines 34-37). The detector system is arranged in the computer tomography device in such a manner that its rows extend in a transverse direction and its columns extend in a longitudinal direction (column 5, lines 41-44). In the detector system, detector cells in a first column from the left have a width of 5 mm whereas those in second and third columns have a width of 2 mm, those in fourth and fifth

columns have a width of 1 mm, those in sixth and seventh columns have a width of 2 mm, and those in eighth column have a width of 5 mm (column 5, lines 46-53). These widths are dimensions in the transverse directions over which the individual detector cells are essentially sensitive to X-rays-which have traversed a patient to be examined and reach the detector system (column 5, lines 53-57).

Claim 2 depends on Claim 1 which recites a method for imaging an organ of a patient including the steps of "scanning a volume of a patient's body including an organ of the patient with a computed tomographic (CT) imaging system having a radiation source and a detector array coupled to a rotating gantry, the detector array having a z-direction parallel to an axis of rotation of the gantry and an x-direction transverse to the z-direction; acquiring attenuation data from a plurality of staggered half detector segments of the detector array, wherein said staggered half detector segments are separated by a gap therebetween, said staggered half detector segments are abutted in regions about a centerline extending in the z-direction, and said staggered half detector segments include at least a first type of detector module having a cable extending into the gap; and–reconstructing an image including the patient's organ using the acquired attenuation data."

None of Toth et al., Oomori et al., Fujise, and Cuppen, considered alone or in combination, describe or suggest a method for imaging an organ of a patient including the steps of scanning a volume of a patient's body including an organ of the patient with a computed tomographic (CT) imaging system having a radiation source and a detector array coupled to a rotating gantry, the detector array having a z-direction parallel to an axis of rotation of the gantry and an x-direction transverse to the z-direction, acquiring attenuation data from a plurality of staggered half detector segments of the detector array, where the staggered half detector segments are separated by a gap therebetween, the staggered half detector segments are abutted in regions about a centerline extending in the z-direction, and the staggered half detector

segments include at least a first type of detector module having a cable extending into the gap, and-reconstructing an image including the patient's organ using the acquired attenuation data.

Moreover, none of Toth et al., Oomori et al., Fujise, and Cuppen, considered alone or in combination, describe or suggest acquiring attenuation data from a plurality of staggered half detector segments of the detector array, where the staggered half detector segments include at least a first type of detector module having a cable extending into the gap. Rather, Toth et al. describe that each switch apparatus included within the detector module has an FET output that is electrically connected to the DAS using a flexible electrical cable, Oomori et al. describe split electrodes that are arranged in a zigzag form in such a way that they are positioned at equal intervals in a longitudinal direction of the array that overlap in the longitudinal direction which is traverse to the z direction and are not abutted in regions about any center line, Fujise describes a computed tomography apparatus in which data is acquired during one or more full rotational cycles and suitably stored by scanning a beating heart or similar objects, and Cuppen describes that detector cells in a first column from the left have a width of 5 mm, whereas those in second and third columns have a width of 2 mm, those in fourth and fifth columns have a width of 1 mm, those in sixth and seventh columns have a width of 2 mm, and those in eighth column have a width of 5 mm. For the reasons set forth above, Claim 1 is submitted to be patentable over Toth et al. in view of Oomori et al. and Fujise, and further in view of Cuppen.

When the recitations of Claim 2 are considered in combination with the recitations of Claim 1, Applicant submits that dependent Claim 2 likewise is patentable over Toth et al. in view of Oomori et al. and Fujise, and further in view of Cuppen.

Claim 7 depends from Claim 3 which recites a radiation detector for an imaging system, the radiation detector having "a centerline extending in a z-direction and including a plurality of staggered half detector segments abutted in regions about said centerline and separated from one another by a gap, said staggered half detector segments each comprising a plurality of detector

VIA FACSIMILE 1-703-872-9306

15-CT-5419
PATENT

modules, and said plurality of detector modules include at least a first type of detector module having a cable extending into the gap."

None of Toth et al., Oomori et al., Fujise, and Cuppen, considered alone or in combination, describe or suggest a radiation detector for an imaging system, the radiation detector having a centerline extending in a z-direction and including a plurality of staggered half detector segments abutted in regions about the centerline and separated from one another by a gap, the staggered half detector segments each including a plurality of detector modules, and the plurality of detector modules include at least a first type of detector module having a cable extending into the gap.

Moreover, none of Toth et al., Oomori et al., Fujise, and Cuppen, considered alone or in combination, describe or suggest radiation detector having a centerline extending in a z-direction and including a plurality of staggered half detector segments abutted in regions about the centerline. Rather, Toth et al. describe that each switch apparatus included within the detector module has an FET output that is electrically connected to the DAS using a flexible electrical cable, Oomori et al. describe split electrodes that are arranged in a zigzag form in such a way that they are positioned at equal intervals in a longitudinal direction of the array that overlap in the longitudinal direction which is traverse to the z direction and are not abutted in regions about any center line, Fujise describes a computed tomography apparatus in which data is acquired during one or more full rotational cycles and suitably stored by scanning a beating heart or similar objects, and Cuppen describes that detector cells in a first column from the left have a width of 5 mm, whereas those in second and third columns have a width of 2 mm, those in fourth and fifth columns have a width of 1 mm, those in sixth and seventh columns have a width of 2 mm, and those in eighth column have a width of 5 mm. For the reasons set forth above, Claim 3 is submitted to be patentable over Toth et al. in view of Oomori et al. and Fujise, and further in view of Cuppen.

When the recitations of Claim 7 are considered in combination with the recitations of Claim 3, Applicant submits that dependent Claim 7 likewise is patentable over Toth et al. in view of Oomori et al. and Fujise, and further in view of Cuppen.

For the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claims 2 and 7 be withdrawn.

The rejection of Claim 8 under 35 U.S.C. § 103 as being unpatentable over Toth et al. in view of Oomori et al., Fujise, and Cuppen, and further in view of Hsieh (U.S. Patent 5,974,109) is respectfully traversed.

Toth et al., Oomori et al., Fujise, and Cuppen are described above. Hsieh describes double and triple cell ganging which resolves any incompatibility between a number of detector channels and a lower number of DAS channels without requiring any significant hardware and software changes (column 2, lines 24-28). In one embodiment, detector cells on one side of a detector are wired in pairs, i.e., ganged, to form sets of 2 mm channels, and on the other side of the detector outside a FOV, some detector cells are wired together, i.e., ganged, to form sets of 3 mm channels and some detector cells are ganged to form sets of 2 mm channels (column 2, lines 28-35). Such ganging of detector cells avoids having to make any significant hardware and software changes to known multislice CT systems (column 2, lines 35-37).

Claim 8 depends from Claim 3 which recites a radiation detector for an imaging system, the radiation detector having "a centerline extending in a z-direction and including a plurality of staggered half detector segments abutted in regions about said centerline and separated from one another by a gap, said staggered half detector segments each comprising a plurality of detector modules, and said plurality of detector modules include at least a first type of detector module having a cable extending into the gap."

VIA FACSIMILE 1-703-872-9306

15-CT-5419
PATENT

None of Toth et al., Oomori et al., Fujise, Cuppen, and Hsieh, considered alone or in combination, describe or suggest a radiation detector for an imaging system, the radiation detector having a centerline extending in a z-direction and including a plurality of staggered half detector segments abutted in regions about the centerline and separated from one another by a gap, the staggered half detector segments each including a plurality of detector modules, and the plurality of detector modules include at least a first type of detector module having a cable extending into the gap.

Moreover, none of Toth et al., Oomori et al., Fujise, Cuppen, and Hsieh, considered alone or in combination, describe or suggest a radiation detector having a centerline extending in a z-direction and including a plurality of staggered half detector segments abutted in regions about the centerline. Rather, Toth et al. describe that each switch apparatus included within the detector module has an FET output that is electrically connected to the DAS using a flexible electrical cable, Oomori et al. describe split electrodes that are arranged in a zigzag form in such a way that they are positioned at equal intervals in a longitudinal direction of the array that overlap in the longitudinal direction which is traverse to the z direction and are not abutted in regions about any center line, Fujise describes a computed tomography apparatus in which data is acquired during one or more full rotational cycles and suitably stored by scanning a beating heart or similar objects, Cuppen describes that detector cells in a first column from the left have a width of 5 mm, whereas those in second and third columns have a width of 2 mm, those in fourth and fifth columns have a width of 1 mm, those in sixth and seventh columns have a width of 2 mm, and those in eighth column have a width of 5 mm, and Hsieh describes that detector cells on one side of a detector are wired in pairs, to form sets of 2 mm channels, and on the other side of the detector, some detector cells are wired together to form sets of 3 mm channels and some detector cells are ganged to form sets of 2 mm channels. For the reasons set forth above, Claim 3 is submitted to be patentable over Toth et al. in view of Oomori et al., Fujise and Cuppen, and further in view of Hsieh.

When the recitations of Claim 8 are considered in combination with the recitations of Claim 3, Applicant submits that dependent Claim 8 likewise is patentable over Toth et al. in view of Oomori et al., Fujise and Cuppen, and further in view of Hsieh.

For the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claim 8 be withdrawn.

The rejection of Claim 10 under 35 U.S.C. § 103 as being unpatentable over Toth et al. in view of Oomori et al. and Fujise, and further in view of Hoffman et al. (U.S. Patent 5,799,057) is respectfully traversed.

Toth et al., Oomori et al., and Fujise are described above. Hoffman et al. describe a scatter collimator that is not complicated and cumbersome to construct, and that effectively absorbs scattered x-rays and substantially prevents such x-rays from impinging a detector array (column 2, lines 49-52).

Claim 10 depends on Claim 3 which recites a radiation detector for an imaging system, the radiation detector having "a centerline extending in a z-direction and including a plurality of staggered half detector segments abutted in regions about said centerline and separated from one another by a gap, said staggered half detector segments each comprising a plurality of detector modules, and said plurality of detector modules include at least a first type of detector module having a cable extending into the gap."

None of Toth et al., Oomori et al., Fujise, and Hoffman et al., considered alone or in combination, describe or suggest a radiation detector for an imaging system, the radiation detector having a centerline extending in a z-direction and including a plurality of staggered half detector segments abutted in regions about the centerline and separated from one another by a gap, the staggered half detector segments each including a plurality of detector modules, and the

plurality of detector modules include at least a first type of detector module having a cable extending into the gap.

Moreover, none of Toth et al., Oomori et al., Fujise, and Hoffman et al., considered alone or in combination, describe or suggest a radiation detector having a centerline extending in a z-direction and including a plurality of staggered half detector segments abutted in regions about the centerline. Rather, Toth et al. describe that each switch apparatus included within the detector module has an FET output that is electrically connected to the DAS using a flexible electrical cable, Oomori et al. describe split electrodes that are arranged in a zigzag form in such a way that they are positioned at equal intervals in a longitudinal direction of the array that overlap in the longitudinal direction which is traverse to the z direction and are not abutted in regions about any center line, Fujise describes a computed tomography apparatus in which data is acquired during one or more full rotational cycles and suitably stored by scanning a beating heart or similar objects, and Hoffman et al. describe a scatter collimator that is not complicated and cumbersome to construct, and that effectively absorbs scattered x-rays and substantially prevents such x-rays from impinging a detector array. For the reasons set forth above, Claim 3 is submitted to be patentable over Toth et al. in view of Oomori et al. and Fujise, and further in view of Hoffman et al.

When the recitations of Claim 10 are considered in combination with the recitations of Claim 3, Applicant submits that dependent Claim 10 likewise is patentable over Toth et al. in view of Oomori et al. and Fujise, and further in view of Hoffman et al.

For the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claim 10 be withdrawn.

The rejection of Claims 12-16, 18, and 20 under 35 U.S.C. § 103 as being unpatentable over Toth et al. in view of Oomori et al., Cuppen, Fujise, and Gordon (U.S. Patent 6,188,745) is respectfully traversed.

VIA FACSIMILE 1-703-872-9306

15-CT-5419
PATENT

Toth et al., Oomori et al., Cuppen, and Fujise are described above. Gordon describes a controllable switch that is provided at the output of each detector element so that a detector element can be used to acquire data when the switch is on, and ignore any sensed data when the switch is off (column 3, lines 33-36). All outputs of the detector elements of each column are summed together so that when a particular set of rows is switched on, the outputs of the switched detector elements of each column are summed together (column 3, lines 36-40). Image artifacts can result should a detector switch be defective for one or more of the detector elements being used to receive and convert X-ray photons (column 4, lines 12-14). A spatially encoded detector arrangement is designed so as to allow for more efficient detection areas for slices of various thicknesses, and preferably one or more sets of simultaneously generated multiple slices (column 4, lines 26-30). The detector elements are sized and arranged so that at least some of the detector elements provided in each of the columns have lengths that vary in the Z-axis direction in accordance with a predetermined sequence code that represents all of the whole integer values in equal incremental values from 1 to N, wherein N is a whole integer greater than 1 (column 4, lines 47-53).

Claim 12 recites a computed tomographic (CT) imaging system for imaging an organ of a patient, the CT system including "a rotating gantry having an axis of rotation, wherein the axis lies along a z-direction; a radiation source configured to rotate with the rotating gantry; and a multislice detector array configured to rotate with the rotating gantry and configured to acquire attenuation data from a patient between the radiation source and the detector, said detector array comprising a plurality of staggered half-detector segments separated from one another by a gap and configured to provide attenuation data having a relatively higher spatial resolution near a centerline extending in the z-direction of said detector array and a relatively lower spatial resolution distal to said centerline, wherein said staggered half detector segments include at least a first type of detector module having a cable extending into the gap; a data acquisition system configured to receive attenuation data from the detector, including the relatively lower spatial

attenuation data and the relatively higher spatial resolution attenuation data, and an image reconstructor configured to utilize the attenuation data to reconstruct an image of the organ, including utilizing the relatively lower spatial resolution data, to thereby reduce artifacts in the image."

None of Toth et al., Oomori et al., Cuppen, Fujise, and Gordon, considered alone or in combination, describe or suggest a computed tomographic (CT) imaging system for imaging an organ of a patient, the CT system including a rotating gantry having an axis of rotation, where the axis lies along a z-direction, a radiation source configured to rotate with the rotating gantry, and a multislice detector array configured to rotate with the rotating gantry and configured to acquire attenuation data from a patient between the radiation source and the detector, the detector array including a plurality of staggered half-detector segments separated from one another by a gap and configured to provide attenuation data having a relatively higher spatial resolution near a centerline extending in the z-direction of the detector array and a relatively lower spatial resolution distal to the centerline, where the staggered half detector segments include at least a first type of detector module having a cable extending into the gap; a data acquisition system configured to receive attenuation data from the detector, including the relatively lower spatial attenuation data and the relatively higher spatial resolution attenuation data, and an image reconstructor configured to utilize the attenuation data to reconstruct an image of the organ, including utilizing the relatively lower spatial resolution data, to thereby reduce artifacts in the image.

Moreover, none of Toth et al., Oomori et al., Cuppen, Fujise, and Gordon, considered alone or in combination, describe or suggest a plurality of staggered half-detector segments separated from one another by a gap and configured to provide attenuation data having a relatively higher spatial resolution near a centerline extending in the z-direction of the detector array and a relatively lower spatial resolution distal to the centerline. Rather, Toth et al. describe that each switch apparatus included within the detector module has an FET output that is

electrically connected to the DAS using a flexible electrical cable, Oomori et al. describe split electrodes that are arranged in a zigzag form in such a way that they are positioned at equal intervals in a longitudinal direction of the array that overlap in the longitudinal direction which is traverse to the z direction and are not abutted in regions about any center line, Cuppen describes that detector cells in a first column from the left have a width of 5 mm, whereas those in second and third columns have a width of 2 mm, those in fourth and fifth columns have a width of 1 mm, those in sixth and seventh columns have a width of 2 mm, and those in eighth column have a width of 5 mm, Fujise describes a computed tomography apparatus in which data is acquired during one or more full rotational cycles and suitably stored by scanning a beating heart or similar objects, and Gordon describes detector elements that are sized and arranged so that at least some of the detector elements provided in each of the columns have lengths that vary in the Z-axis direction in accordance with a predetermined sequence code that represents all of the whole integer values in equal incremental values from 1 to N. For the reasons set forth above, Claim 12 is submitted to be patentable over Toth et al. in view of Oomori et al., Cuppen, Fujise, and Gordon.

Claims 13-16, 18, and 20 depend from independent Claim 12. When the recitations of Claims 13-16, 18, and 20 are considered in combination with the recitations of Claim 12, Applicant submits that dependent Claims 13-16, 18, and 20 likewise is patentable over Toth et al. in view of Oomori et al., Cuppen, Fujise, and Gordon.

For the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claims 12-16, 18, and 20 be withdrawn.

The rejection of Claim 17 under 35 U.S.C. § 103 as being unpatentable over Toth et al. in view of Oomori et al., Cuppen, Fujise, and Gordon, and further in view of Hsieh is respectfully traversed.

Toth et al., Oomori et al., Cuppen, Fujise, Gordon, and Hsieh are described above.

VIA FACSIMILE 1-703-872-9306

15-CT-5419
PATENT

Claim 17 depends on Claim 12 which recites a computed tomographic (CT) imaging system for imaging an organ of a patient, the CT system including "a rotating gantry having an axis of rotation, wherein the axis lies along a z-direction; a radiation source configured to rotate with the rotating gantry; and a multislice detector array configured to rotate with the rotating gantry and configured to acquire attenuation data from a patient between the radiation source and the detector, said detector array comprising a plurality of staggered half-detector segments separated from one another by a gap and configured to provide attenuation data having a relatively higher spatial resolution near a centerline extending in the z-direction of said detector array and a relatively lower spatial resolution distal to said centerline, wherein said staggered half detector segments include at least a first type of detector module having a cable extending into the gap; a data acquisition system configured to receive attenuation data from the detector, including the relatively lower spatial attenuation data and the relatively higher spatial resolution attenuation data, and an image reconstructor configured to utilize the attenuation data to reconstruct an image of the organ, including utilizing the relatively lower spatial resolution data, to thereby reduce artifacts in the image."

None of Toth et al., Oomori et al., Cuppen, Fujise, Gordon, and Hsieh, considered alone or in combination, describe or suggest a computed tomographic (CT) imaging system for imaging an organ of a patient, the CT system including a rotating gantry having an axis of rotation, where the axis lies along a z-direction, a radiation source configured to rotate with the rotating gantry, and a multislice detector array configured to rotate with the rotating gantry and configured to acquire attenuation data from a patient between the radiation source and the detector, the detector array including a plurality of staggered half-detector segments separated from one another by a gap and configured to provide attenuation data having a relatively higher spatial resolution near a centerline extending in the z-direction of the detector array and a relatively lower spatial resolution distal to the centerline, where the staggered half detector segments include at least a first type of detector module having a cable extending into the gap; a

data acquisition system configured to receive attenuation data from the detector, including the relatively lower spatial attenuation data and the relatively higher spatial resolution attenuation data, and an image reconstructor configured to utilize the attenuation data to reconstruct an image of the organ, including utilizing the relatively lower spatial resolution data, to thereby reduce artifacts in the image.

Moreover, none of Toth et al., Oomori et al., Cuppen, Fujise, Gordon, and Hsieh, considered alone or in combination, describe or suggest a plurality of staggered half-detector segments separated from one another by a gap and configured to provide attenuation data having a relatively higher spatial resolution near a centerline extending in the z-direction of said detector array and a relatively lower spatial resolution distal to said centerline. Rather, Toth et al. describe that each switch apparatus included within the detector module has an FET output that is electrically connected to the DAS using a flexible electrical cable, Oomori et al. describe split electrodes that are arranged in a zigzag form in such a way that they are positioned at equal intervals in a longitudinal direction of the array that overlap in the longitudinal direction which is traverse to the z direction and are not abutted in regions about any center line, Cuppen describes that detector cells in a first column from the left have a width of 5 mm, whereas those in second and third columns have a width of 2 mm, those in fourth and fifth columns have a width of 1 mm, those in sixth and seventh columns have a width of 2 mm, and those in eighth column have a width of 5 mm, Fujise describes a computed tomography apparatus in which data is acquired during one or more full rotational cycles and suitably stored by scanning a beating heart or similar objects, Gordon describes detector elements that are sized and arranged so that at least some of the detector elements provided in each of the columns have lengths that vary in the Z-axis direction in accordance with a predetermined sequence code that represents all of the whole integer values in equal incremental values from 1 to N, and Hsieh describes that detector cells on one side of a detector are wired in pairs, to form sets of 2 mm channels, and on the other side of the detector, some detector cells are wired together to form sets of 3 mm channels and some

detector cells are ganged to form sets of 2 mm channels. For the reasons set forth above, Claim 12 is submitted to be patentable over Toth et al. in view of Oomori et al., Cuppen, Fujise and Gordon, and further in view of Hsieh.

When the recitations of Claim 17 are considered in combination with the recitations of Claim 12, Applicant submits that dependent Claim 17 likewise is patentable over Toth et al. in view of Oomori et al., Cuppen, Fujise and Gordon, and further in view of Hsieh.

For the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claim 17 be withdrawn.

The rejection of Claim 19 under 35 U.S.C. § 103 as being unpatentable over Toth et al. in view of Oomori et al., Cuppen, Fujise, and Gordon, and further in view of Hoffman et al. is respectfully traversed.

Toth et al., Oomori et al., Cuppen, Fujise, Gordon, and Hoffman et al. are described above.

Claim 19 depends from Claim 12 which recites a computed tomographic (CT) imaging system for imaging an organ of a patient, the CT system including "a rotating gantry having an axis of rotation, wherein the axis lies along a z-direction; a radiation source configured to rotate with the rotating gantry; and a multislice detector array configured to rotate with the rotating gantry and configured to acquire attenuation data from a patient between the radiation source and the detector, said detector array comprising a plurality of staggered half-detector segments separated from one another by a gap and configured to provide attenuation data having a relatively higher spatial resolution near a centerline extending in the z-direction of said detector array and a relatively lower spatial resolution distal to said centerline, wherein said staggered half detector segments include at least a first type of detector module having a cable extending into the gap; a data acquisition system configured to receive attenuation data from the detector,

including the relatively lower spatial attenuation data and the relatively higher spatial resolution attenuation data, and an image reconstructor configured to utilize the attenuation data to reconstruct an image of the organ, including utilizing the relatively lower spatial resolution data, to thereby reduce artifacts in the image."

None of Toth et al., Oomori et al., Cuppen, Fujise, Gordon, and Hoffman et al., considered alone or in combination, describe or suggest a computed tomographic (CT) imaging system for imaging an organ of a patient, the CT system including a rotating gantry having an axis of rotation, where the axis lies along a z-direction, a radiation source configured to rotate with the rotating gantry, and a multislice detector array configured to rotate with the rotating gantry and configured to acquire attenuation data from a patient between the radiation source and the detector, the detector array including a plurality of staggered half-detector segments separated from one another by a gap and configured to provide attenuation data having a relatively higher spatial resolution near a centerline extending in the z-direction of the detector array and a relatively lower spatial resolution distal to the centerline, where the staggered half detector segments include at least a first type of detector module having a cable extending into the gap; a data acquisition system configured to receive attenuation data from the detector, including the relatively lower spatial attenuation data and the relatively higher spatial resolution attenuation data, and an image reconstructor configured to utilize the attenuation data to reconstruct an image of the organ, including utilizing the relatively lower spatial resolution data, to thereby reduce artifacts in the image.

Moreover, none of Toth et al., Oomori et al., Cuppen, Fujise, Gordon, and Hoffman et al., considered alone or in combination, describe or suggest a plurality of staggered half-detector segments separated from one another by a gap and configured to provide attenuation data having a relatively higher spatial resolution near a centerline extending in the z-direction of said detector array and a relatively lower spatial resolution distal to said centerline. Rather, Toth et al. describe that each switch apparatus included within the detector module has an FET output that

is electrically connected to the DAS using a flexible electrical cable, Oomori et al. describe split electrodes that are arranged in a zigzag form in such a way that they are positioned at equal intervals in a longitudinal direction of the array that overlap in the longitudinal direction which is traverse to the z direction and are not abutted in regions about any center line, Cuppen describes that detector cells in a first column from the left have a width of 5 mm, whereas those in second and third columns have a width of 2 mm, those in fourth and fifth columns have a width of 1 mm, those in sixth and seventh columns have a width of 2 mm, and those in eighth column have a width of 5 mm, Fujise describes a computed tomography apparatus in which data is acquired during one or more full rotational cycles and suitably stored by scanning a beating heart or similar objects, Gordon describes detector elements that are sized and arranged so that at least some of the detector elements provided in each of the columns have lengths that vary in the Z-axis direction in accordance with a predetermined sequence code that represents all of the whole integer values in equal incremental values from 1 to N, and Hoffman et al. describe a scatter collimator that is not complicated and cumbersome to construct, and that effectively absorbs scattered x-rays and substantially prevents such x-rays from impinging a detector array. For the reasons set forth above, Claim 12 is submitted to be patentable over Toth et al. in view of Oomori et al., Cuppen, Fujise and Gordon, and further in view of Hoffman et al.

When the recitations of Claim 19 are considered in combination with the recitations of Claim 12, Applicant submits that dependent Claim 19 likewise is patentable over Toth et al. in view of Oomori et al., Cuppen, Fujise and Gordon, and further in view of Hoffman et al.

For the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claim 19 be withdrawn.

VIA FACSIMILE 1-703-872-9306

15-CT-5419
PATENT

In view of the foregoing remarks, this application is believed to be in condition for allowance. Reconsideration and favorable action is respectfully solicited.

Respectfully Submitted,

Thomas M. Fisher
Registration No. 47,564
ARMSTRONG TEASDALE LLP
One Metropolitan Square, Suite 2600
St. Louis, Missouri 63102-2740
(314) 621-5070